



Forest Health Protection Pacific Southwest Region

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To: District Ranger, American River Ranger District, Tahoe National Forest

Subject: Evaluation of western pine beetle activity in the Elliot Ranch plantation (FHP Report NE10-07)

At the request of Kelly Pavlica, Silviculturist, American River Ranger District, Tahoe National Forest, I conducted a field evaluation of proposed thinning treatment areas within the Elliot Ranch plantation on June 1, 2010. The objectives of the visit were to evaluate western pine beetle (*Dendroctonus brevicomis*) activity and stand conditions and to discuss treatment alternatives. Kelly Pavlica and Tony Rodarte accompanied me in the field.

Background

The Elliot Ranch ponderosa pine (*Pinus ponderosa*) plantation, established in 1950 after a wildfire, is located about 11 miles NE of Foresthill, CA at elevations ranging between 3800 and 4500 feet (approx. 39° 09' 12.4"N and 120° 45' 22.6"W). Annual precipitation is approximately 60 inches. Long-term management objectives for this plantation are to reduce stand density, increase tree species diversity and use prescribed fire to maintain desired fuel loadings.

Observations

Average density within most of the proposed treatment units is well above recommended levels that would reduce the risk of successful western pine beetle attacks in ponderosa pine stands. Data provided by the District shows that the average Stand Density Index (SDI) within the proposed treatment areas is 438 and the average basal area is 314 sq.ft./acre.

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Western pine beetle activity is high within this entire area as group killing of pole and sawtimber sized ponderosa pine is evident throughout the plantation. Most of this mortality has occurred over the past 2-3 years (Region 5 Aerial Detection Survey 2007-2009) but is continuing based on the observation of green infested trees during this visit.

Discussion

High stand density combined with drought conditions cause extreme moisture stress in individual trees, thus reducing their ability to fend off bark beetle attacks. Healthy ponderosa pines defend themselves by producing resins that drown attacking beetles. When trees are stressed, resin pressure is reduced and the probability of successful bark beetle attack is increased. High stand density may also improve conditions for the bark beetle pheromone communication system, which facilitates mass attacks on individual trees, by concentrating the pheromone plume under a full canopy.

Bark beetle caused mortality has increased throughout California due in part to below normal precipitation experienced three of the past four years. Western pine beetle caused mortality of ponderosa pine has also increased in many areas with higher levels of mortality occurring in overstocked stands. Dense stands of even-aged ponderosa pine are especially susceptible to large group killing of trees during extended periods of below normal precipitation as was observed in the Elliot Ranch plantation. Even with the mortality that has occurred here over the past two to three years, stand densities are still extremely high and the potential exists for significantly more bark beetle caused mortality. For example, the current SDI level of 438 that exists within the proposed treatment areas is well above the limiting SDI of 365 for ponderosa pine. SDI 365 is considered the upper management zone above which bark beetle outbreaks are likely to occur (Oliver 1995).

The best strategy to decrease the amount of additional mortality in the immediate and long-term is to reduce stand density through thinning. Thinning will increase the health and vigor of residual ponderosa pines by reducing competition for limited soil moisture (Fettig et al. 2007). Opening up the canopy may also disrupt the pheromone communication system by creating convection currents and air turbulence through increases in soil temperature (Bartos and Amman 1989).

The District is proposing to reduce SDI within the Elliot Ranch treatment units to below 230. SDI 230 is the defined threshold for the zone of imminent bark beetle caused mortality. Within this zone, endemic populations kill a few trees but net growth is still positive (Oliver 1995). Thinning stands to this level will reduce the risk of additional bark beetle caused mortality by reducing tree competition for limited water and nutrients. Thinning to this level would also be consistent with past direction from the Regional Forester that suggests designing thinnings to “ensure that density does not exceed an upper limit (for example: 90% of normal basal area, or 60% of maximum stand density index)” and to “design thinnings to ensure that this level will not be reached again for at least 20 years after thinning.” (Regional Forester letter, “Conifer Forest Density Management for Multiple Objectives”, July 14, 2004).

This thinning project will be covered under the National Environmental Policy Act (NEPA) by Categorical Exclusion #14 [36 CFR 220.6(e)(14)] *Commercial and non-commercial sanitation harvest of trees to control insects or disease not to exceed 250 acres, requiring no more than ½ mile of temporary road construction, including removal of infested/infected trees and adjacent live uninfested/uninfected trees as determined necessary to control the spread of insects or disease.*

Based on my observations of the Elliot Ranch site, and the information provided within this evaluation, it is my opinion that this project meets the criteria outlined in this categorical exclusion.

If you have any questions regarding this report and/or need additional information please contact me at 530-252-6431.

/s/ Danny Cluck

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cc: Kelly Pavlica, American River RD
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Citations:

Bartos, D.L., Amman, G.D., 1989. Microclimate: an Alternative to Tree Vigor as a Basis for Mountain Pine Beetle Infestations. RP-INT-400. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT, 10 pp.

Fettig, C.J.; Klepzig, K.D.; Billings, R.F.; Munson, A.S.; Nebeker, T.E.; Negrón, J.F.; Nowak, J.T. 2007. The effectiveness of vegetation management practices for prevention and control of bark beetle outbreaks in coniferous forests of the western and southern United States. *Forest Ecology and Management*. 238: 24–53.

Oliver, W.W., 1995. Is self-thinning in ponderosa pine ruled by *Dendroctonus* bark beetles? In: *Proceedings of the 1995 National Silviculture Workshop, GTR-RM-267*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, C.O., pp., 213–218.

Western Pine Beetle Information

The western pine beetle, *Dendroctonus brevicomis*, has been intensively studied and has proven to be an important factor in the ecology and management of ponderosa pine throughout the range of this host species (Miller and Keen 1960). This insect breeds in the main bole of living ponderosa pine larger than about 8 inches dbh. Normally it breeds in trees weakened by drought, overstocking, root disease, dwarf mistletoe or fire. Adult beetles emerge and attack trees continuously from spring through fall. Depending on the latitude and elevation, there can be from one to four generations per year.

Evidence of Attack

Initial attacks are made about mid-bole and subsequent attacks fill in above and below. Pitch tubes are formed on the tree trunk around the entry holes. The pitch tubes are red-brown masses of resin and boring dust. Relatively few, widely scattered, white pitch tubes usually indicate that the attacks were not successful and that the tree should survive. Pheromones released during a successful attack attract other western pine beetles. Attacking beetles may spill over into nearby apparently healthy trees and overwhelm them by sheer numbers.

Life Stages and Development

These beetles pass through the egg, larval, pupal and adult stages during a life-cycle that varies in length dependent primarily upon temperature. Adults bore a sinuous gallery pattern in the phloem and the female lays eggs in niches along the sides of the gallery. The larvae are small white grubs that first feed in the phloem and then mine into the middle bark where they complete most of their development. Bluestain fungi, introduced during successful attacks, contribute to the rapid tree mortality associated with bark beetle attacks.

Conditions Affecting Outbreaks

Outbreaks of western pine beetle have been observed, and surveys made, in pine regions of the West since 1899 (Hopkins 1899; cited in Miller and Keen 1960). An insect survey completed in 1917 in northern California indicated that over 25 million board feet of pine timber had been killed by bark beetles. Information from surveys initiated in the 1930s indicates that there were enormous losses attributed to western pine beetle around that time. During the 1930's outbreak, most of the mortality occurred in stands of mature or overmature trees of poor vigor (Miller and Keen 1960). Group kills do not typically continue to increase in size through successive beetle generations as is typical with Jeffrey pine beetle. Rather, observations indicate that emerging beetles tend to leave the group kill area to initiate new attacks elsewhere.

The availability of suitable host material is a key condition influencing western pine beetle outbreaks. In northeastern California, drought stress may be the key condition influencing outbreaks. When healthy trees undergo a sudden and severe moisture stress populations of western pine beetle are likely to increase. Healthy trees ordinarily produce abundant amounts of resin, which pitch out attacking beetles, but when deprived of moisture, stressed trees cannot produce sufficient resin flow to resist attack. Any condition that results in excessive demand for moisture, such as tree crowding, competing vegetation or protracted drought periods; or any condition that reduces that ability of the roots to supply water to the tree, such as mechanical damage, root disease, or soil compaction, can cause moisture stress and increase susceptibility to attack by the western pine beetle. Woodpeckers and predaceous beetles are natural control agents when beetle populations are low.